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BACKFILLING AS PRACTICED IN KUZBASS COAL MINES

I. Ye. Atlas
Z. M. Leytes

In working thick, steeply dipping seams in the Kuznetsk Basin, four different methods of backfilling are used at present: gravity, hydraulic, mechanical, and pneumatic.

The choice of method is determined by actual conditions of the lay of the seam and the existing method of working it. However, with some types of mining, more than one method of backfilling can be used; for example, in mining by horizontal slicing, both pneumatic and mechanical backfilling are employed and, in mining by diagonal slicing and long pillars, both the hydraulic method and the gravity method are used.

To determine comparative technical and economic indexes of the various types of backfilling, the VUGI (All-Union Scientific Research Coal Institute) made an analysis in 1951 of actual data on the productivity of backfilling installations and also on the labor and expense involved in their use.

The ten sections selected for study from the Mine imeni Stalin, Mine No 3-3-bis, Mine imeni Voroshilov, and Mine imeni Kalinin accounted for about 20 percent of the coal output from mines of the Kuzbassugol' Combine which employ backfilling. In three of the sections studied the gravity method was used; in two, the hydraulic method; in four, the pneumatic, and in one, the mechanical. The systems of mining employed were horizontal and transverse diagonal slicing (in six sections), diagonal slicing (in three sections), and long pillars along the strike (in one section).

The materials used for backfilling are obtained from central or local mine pits. Cost of materials varies within a wide range depending on a variety of circumstances.

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Observations were carried on for 5 months in the ten sections. Results are given in the series of tables which follows.

Table 1. Comparative Average Costs per Cubic Meter of Backfilling

Method of Backfilling	Mining Method	Actual Costs per Cubic Meter of Backfilling (rubles)	In Percent of Cost of Gravity Backfilling
Gravity	Diagonal slicing, long pillars along the strike	10.5	100
Hydraulic	Diagonal slicing	13.5	129
	Transverse diagonal slicing	15.5	148
Pneumatic	Horizontal slicing	17.0	162
Mechanical	Horizontal slicing	22.0	210

Table 2. Percentage Breakdown of Costs of Processes Involved in Backfilling

	Loading of Backfilling Material at Surface and Lowering It to Proper Level	Underground Transport From Shaft to Section	Backfilling Operations in Extraction Section	Drainage and Removal of Small Particles	Total Costs
Gravity	28	24	48	--	100
Hydraulic	59	--	17	24	100
Pneumatic	18	15	67	--	100
Mechanical	14	11	75	--	100

Table 3. Percentage Breakdown of Expense Items in Backfilling

	Wages and Extras	Materials Excluding Backfilling	Power	Amortization	Other Expenses	Total Expenses
Gravity	57	12	5	11	5	100
Hydraulic	69	9	12	7	3	100
Pneumatic	55	8	22	9	3	100
Mechanical	76	10	3	8	3	100

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Table 4. Number of Man-Shifts per 1,000 Cubic Meters of Backfilling

	Gravity Backfilling (Section No 10, Mine imeni Stalin)	Hydraulic Backfilling (Section No 22, Mine imeni Stalin	Pneumatic Backfilling (Section No 10, Mine imeni Stalin)	Mechanical Backfilling (Section No 10, Mine imeni Kalinin)
Loading of backfilling material at surface and lowering it to proper level	68	157	70	44
Including:				
Loading of backfilling	61	--	62	30
Repair and inspection of backfilling installations	--	88	--	--
Conveyance of pulp	--	46	--	--
Technical inspection	7	23	8	14
Underground transport from shaft (borehole) to extraction section	42	--	50	70
Backfilling operations in extraction section	24	21	79	332
Drainage and removal of small particles	--	37	--	--

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Table 5. Work Time and Idle Periods of PZM Pneumatic Machine (Pneumatic Backfilling)

Apportionment of Time of Backfilling Shift	Length of Time (min)		Percent of Time Shift	
	Mine imeni Stalin (Av data for 101 time observations)	Mine imeni Voroshilov (Av data for 45 time observations)	Mine imeni Stalin	Mine imeni Voroshilov
Work time of backfilling machine	148	140	30.8	29.2
Idle time of backfilling machine	332	340	69.2	70.8
Including:				
Shortage and low pressure of compressed air	122	128	25.4	26.6
Adjusting of pipes	75	22	15.6	4.6
Shortening of pipes and change of joints	37	35	7.7	7.3
Repair of machine	31	19	6.6	4.0
Repair of feeders	16	16	3.3	3.3
Shortage of backfilling material	4	40	0.8	8.3
Other idle time	47	80	9.8	16.7

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